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1 "CASING CENTRALISER"

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3 The invention relates to a casing centralizer. This
4 application is a Continuation-In-Part of PCT/GB98/00554
5 to which filing details have not yet been assigned by
6 the USPTO.

7

8 Background to the invention.

9 When a well has been drilled for the eventual
10 production of hydrocarbons, one of the procedures
11 commonly employed in readying the well for production
12 comprises installing hollow tubular casing in the well
13 to line the borehole. The space between the exterior
14 of the casing and the sides of the borehole are filled
15 with cement, which acts as a sealant and provides
16 mechanical support for the casing. As it is desirable
17 that the casing be centralized in the well bore when
18 cemented, proposals have been made for providing the
19 casing (prior to cementing) with externally mounted
20 centralisers to hold the casing away from the well bore
21 and towards the centre of the bore.

22

23 Summary of the invention.

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1 longitudinally therethrough, the annular body being
2 formed from at least one material selected from the
3 group consisting of plastic material, elastomeric
4 material and rubber material, the substantially
5 cylindrical bore being a clearance fit around the
6 tubular casing to be centralised by the centraliser.

7
8 In a preferred embodiment the invention provides a
9 casing centraliser assembly comprising tubular casing
10 and a centraliser as defined above.

11
12 Typically, the plastic, elastomeric and/or rubber
13 material may comprise polytetrafluoroethylene (PTFE),
14 polyetheretherketone, carbon reinforced
15 polyetheretherketone, polyphthalamide, polyvinylidene
16 fluoride, polyphenylene sulphide, polyetherimide,
17 polyethylene, polysulphone, polyethersulphone,
18 polybutyleneterephthalate, polyetherketoneketone,
19 polyamides, rubber & rubber compounds, phenolic resins
20 or compounds, thermosetting plastics, thermoplastic
21 elastomers, thermoplastic compounds or thermoplastic
22 polyester resins.

23
24 In one example of the invention, the plastic,
25 elastomeric or rubber material may contain a filler
26 material, such as glass, carbon, PTFE, silicon,
27 molybdenum disulphide, graphite, oil or wax, or any
28 combination of these materials.

29
30 The annular body may be manufactured from and consist
31 of the plastic, elastomeric and/or rubber material.
32 However, the annular body may comprise a combination of
33 the plastic, elastomeric and/or rubber material and
34 another material such as a metal. For example, the
35 annular body may comprise a metal skeleton or other

3

1 structure coated, or partially coated, with the
2 plastic, elastomeric or rubber material. In addition,
3 or as an alternative, the annular body may comprise a
4 combination of different plastic, elastomeric and/or
5 rubber materials.

6
7 The annular body may be formed in one or more sections
8 which may be assembled around the tubular to be
9 centralised by the centraliser. In one embodiment the
10 annular body is divided into 2 sections along its axis
11 so that each section forms a "half shell" arrangement.
12 The concave surface of one section can be fitted direct
13 against one side of the outer surface of the tubular
14 and connected to another section similarly positioned
15 against the opposite side of the tubular. The 2
16 sections can then be connected around the tubular to
17 make up the centraliser so that it does not need to be
18 offered up to the end of the tubular. This can be very
19 useful in coil tubing applications.

20
21 The division between the sections need not be axial.

22
23 In some embodiments the sections can be hingedly
24 attached to one another. In others the 2 sections can
25 be separate. There can be more than 2 sections
26 provided. It is sufficient that the sections are
27 adapted to allow the centraliser to be placed around
28 the tubular without needing to be threaded over an end
29 of the tubular.

30
31 The sections are preferably held together by fixings
32 and/or hinges. Preferred fixings include bolts but
33 catches and locks can also be used.

34
35 Preferably the centraliser further comprises a

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1 peripheral array of a plurality of longitudinally
2 extending blades circumferentially distributed around
3 said body to define a flow path between each
4 circumferentially adjacent pair of said blades, each
5 said flow path providing a fluid flow path between
6 longitudinally opposite ends of said centraliser², each
7 said blade having a radially outer edge providing a
8 well bore-contacting surface.

9
10 Said centraliser² is preferably free of any means
11 tightly gripping a casing when said centraliser² is
12 installed thereon, whereby said centraliser² and said
13 casing are mutually rotatable.

14
15 Said blades are preferably mutually substantially
16 equidistantly distributed around said body. Said blades
17 preferably each extend circumferentially at least
18 part-way around said body between longitudinally
19 opposite ends thereof to provide a circumferential
20 distribution of each said well bore-contacting surface.
21 Each said blade preferably has a radially inner root
22 integral with said body, each said radially inner root
23 preferably being circumferentially wider than the
24 respective radially outer edge. Said blades are
25 preferably circumferentially wider at one end of the
26 centraliser² than at the other end, said one end
27 preferably the lower end of the centraliser² in use
28 thereof. Said centraliser² preferably has five of said
29 blades.

30
31 Longitudinally opposite ends of said blades and/or of
32 said body may be chamfered or tapered whereby to
33 facilitate passage of said centraliser down a well
34 bore.
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1 Brief description of the drawings.

2 Examples of a casing centralizer² in accordance with the
3 invention will now be described with reference to the
4 accompanying drawings, in which:-

5

6 Fig. 1 is a perspective view from above and to one
7 side of a first example of a casing centralizer²;
8 Fig. 2 is a plan view from above of the first
9 example;

10 Fig. 3 is an underneath view of the first example;
11 Figs. 4 and 5 are respectively radial (plan) and
12 circumferential (side) views of a blade forming
13 part of the first example;

14 Fig. 6 is a perspective view of a casing
15 centralizer² mounted on casing in a borehole;

16 Fig 7a shows a side view of a second centralizer²
17 on a tubular, Fig 7b shows the same centralizer² in
18 plan view, and Fig 7c shows the same centralizer²
19 in exploded plan view.

20

21 Description of preferred embodiments.

22 Referring first to Figs. 1 to 3, a casing centralizer²
23 10 is a unitary annulus comprising a generally
24 cylindrical body 12, and an array of five
25 equiangularly-spaced blades 14 integrally formed with
26 the body 12. A cylindrical bore 16 extends
27 longitudinally and coaxially through the body 12, the
28 bore 16 having a substantially uniform diameter
29 dimensioned to be a clearance fit around the well bore
30 casing (not shown in Figs. 1 to 8). Each of the blades
31 14 (see also Figs. 4 and 5) not only extends between
32 longitudinally opposite ends of the body 12, but also
33 extends circumferentially part-way around the periphery
34 of the centralizer² 10. The skewing of the blade 14
35 ensures that their respective radially outer edges 18

1 collectively provide a circumferentially substantially
2 uniform well bore-contacting surface for the
3 centraliser 10, as most particularly shown in Figs. 2
4 and 3.

5
6 Each of the blades 14 has a respective radially inner
7 root 20 integral with the body 12. In each of the
8 blades 14, the root 20 has a greater circumferential
9 width than the outer edge 13, ie the cross-section of
10 each blade 14 tapers towards the well bore-contacting
11 periphery of the centraliser 10. The individual and
12 collective shapes of the blades 14, and of the
13 longitudinal fluid flow passages defined between
14 adjacent pairs of the blades 14, gives the centraliser
15 10 improved flow characteristics and minimises the
16 build-up of trapped solids during use of the
17 centraliser 10.

18
19 Longitudinally opposite ends of the blades 14, and of
20 the body 12, are chamfered to assist in movement of the
21 centraliser 10 up/down a well bore.

22
23 Although the blades 14 are shown separately from the
24 body 12 in Figs 4 and 5 (and while the blades 4 could
25 be separately formed and subsequently attached to the
26 body 12 by any suitable means) it is preferred that the
27 entire centraliser 10 is fabricated as a one-piece
28 article.

29
30 The centraliser 10 may be manufactured entirely from a
31 plastics, elastomeric and/or rubber material.
32 Alternatively, the centraliser 10 may comprise a metal
33 body coated, or partially coated, with a plastic,
34 elastomeric and/or rubber material.

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1 Examples of possible plastic, elastomeric and/or rubber
2 materials are polytetrafluoroethylene (PTFE),
3 polyetheretherketone, carbon reinforced
4 polyetheretherketone, polyphthalamide, polyvinylidene
5 fluoride, polyphenylene sulphide, polyetherimide,
6 polyethylene, polysulphone, polyethersulphone,
7 polybutyleneterephthalate, polyetherketoneketone,
8 polyamides, rubber & rubber compounds, phenolic resins
9 or compounds, thermosetting plastics, thermoplastic
10 elastomers, thermoplastic compounds or thermoplastic
11 polyester resins.

12
13 The plastics, elastomeric and/or rubber material may
14 contain a filler. Examples of possible fillers are
15 glass, carbon, PTFE, silicon, molybdenum disulphide,
16 graphite, oil or wax, or any combination of these
17 materials.

18
19 Use of a plastic, elastomeric and/or rubber material
20 gives a number of advantages, including:- chemical
21 resistance, such as resistance to acid; non-sparking
22 (ie sparks are not generated if the centraliser 10
23 collides with steel); and, materials such as PTFE give
24 superior bearing properties.

25
26 Since the bore 16 is a clearance fit around the casing
27 and since the bore 16 lacks any means of tightly
28 gripping a normally dimensioned casing, the centraliser
29 10 can not only rotate freely around the casing but
30 also move freely along the casing (unless and until the
31 centraliser collides with an obstruction, for example a
32 protruding casing joint). Thus to provide longitudinal
33 restraint for the centraliser 10 to retain the
34 centraliser substantially at its preferred location
35 along the casing but without impairing the relative

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1 rotatability of centraliser² and casing, use is made of
2 a stop collar 50, as illustrated in Fig. 6.

3
4 Fig. 6 shows a modified form of casing centraliser² 100,
5 fitted around hollow tubular casing 102 which is
6 located within a well bore 104. The modified
7 centraliser² 100 is essentially the same as the
8 centraliser² 10 described above, and differs principally
9 in the dimensions and proportions of its blades 106.
10 In particular, the blades 106 are circumferentially
11 wider at the lower end of the centraliser² 100 than they
12 are at the upper end. Fig. 6 also illustrates the
13 manner in which the centraliser² will hold casing out of
14 direct contact with the well bore and centrally within
15 the well bore, in preparation for subsequent cementing.

16
17 Fig 7 shows a modified plastic centraliser² 110 located
18 around a length of casing 112. The centraliser 110 has
19 blades R1, R2, R3 and R4 spaced around its outer
20 surface to contact the inner surface of the wellbore
21 and to centralise² the casing 112 therein. The blades R
22 extend axially along the centraliser² but can
23 alternatively extend around the outer circumference of
24 the centraliser² like the blades 106.

25
26 The centraliser 110 is axially divided along the
27 midline of opposing blades R2 and R4 to form two half
28 shells 110a and 110b, so that the blades R2 and R4 are
29 formed only when the opposing faces F of the half
30 shells 110a and 110b are joined together. Half shell
31 110a has two threaded sockets S in each of the faces F
32 of R2 and R4 to receive bolts B protruding through the
33 faces F of the other half shell 110b. The bolts B
34 engage in the sockets S and pull the faces F together
35 when the centraliser² 110 is made up around the casing

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1 112 and the bolts tightened.

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3 The centraliser^z 110 can be formed from
4 polytetrafluoroethylene (PTFE), polyetheretherketone,
5 carbon reinforced polyetheretherketone,
6 polyphthalamide, polyvinylidene fluoride,
7 polyphenylene sulphide, polyetherimide, polyethylene,
8 polysulphone, polyethersulphone,
9 polybutyleneterephthalate, polyetherketoneketone,
10 polyamides, rubber & rubber compounds, phenolic resins
11 or compounds, thermosetting plastics, thermoplastic
12 elastomers, thermoplastic compounds or thermoplastic
13 polyester resins.

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15 The centraliser^z 110 is useful with coil tubing
16 applications, but may also be used for casing and
17 screens to afford protection from acids and other
18 harmful chemicals downhole.

19

20 In the case of casing located within larger diameter
21 casing, centralisers^z can be employed on the inner
22 casing to hold it out of direct contact with the outer
23 casing.

24

25 Advantages of the invention are that the use of a
26 plastics, elastomeric and/or rubber material for the
27 centraliser helps to provide chemical resistance, such
28 as resistance to corrosion from acid. Other advantages
29 are that the materials are generally non sparking and
30 that certain materials, for example PTFE, have superior
31 bearing properties.

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